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**Freezing of supercooled water nanodroplets**[1]

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All three states of water play important roles in nature, from thermostating the atmosphere to providing reactive surfaces environments. The rates at which transitions between the phases occur, the degree to which pure liquid water can be supercooled, and the solid phases that form are all fundamentally interesting questions with strong atmospheric relevance. We have followed and characterized the nucleation, growth, and subsequent freezing of pure water droplets formed in a supersonic nozzle apparatus using both Small Angle X-ray Scattering (SAXS) and Fourier Transform Infrared Spectroscopy (FTIR). Because the droplets have radii $r$ between 3 nm and 6 nm, and the cooling rates are on the order of 5E5 K/s, liquid water only begins to freeze below approximately 215 K. These temperatures are well below the homogeneous freezing limit for bulk water. The experiments show the expected decrease in freezing temperature with decreasing droplet size, or alternatively, with increasing droplet internal pressure.

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